[10191/2202]

LIGHT-SENSITIVE SENSOR UNIT, IN PARTICULAR FOR AUTOMATIC SWITCHING OF LIGHTING DEVICES

Field Of The Invention

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The present invention relates to a light-sensitive sensor unit, in particular for automatic switching of lighting devices in vehicles.

Background Information

Such a sensor unit is known from German Patent No. 195 23 262.3, which includes a global sensor and a directional sensor for detecting the lighting conditions outside the vehicle. The sensor unit is connected to the analyzer unit which determines from the signals of the sensor unit whether a change in the circuit state of the lighting device is necessary under the given lighting conditions prevailing in the surroundings of the vehicle. Although this known sensor unit permits automatic switching of the lighting device, it includes a relatively large number of parts due to the global sensors and the directional sensors, and this means a high cost and expensive adjustment.

Summary Of The Invention

The device according to the present invention has the advantage that a simple, compact, robust, easy-to-assemble and practically adjustment-free sensor unit is available due to the integration of the global and directional sensors. Furthermore, the device includes only a minimal number of components, which permits simple and inexpensive production with expanded functionality. The small dimensions which are possible due to the integration of the global and directional sensors have proven to be another major advantage, because the size of components on the windshields of motor vehicles which interfere with vision should be minimized.

Due to the fact that at least three sensors detect light from predetermined directions,

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a wider range in front of the vehicle is detected. If at least one sensor is arranged in the direction of travel and the two other sensors are arranged, pivoted out of the direction of travel by an angle α on both sides, this yields a wide cone of detection in front of the vehicle, so that even the entrance of a tunnel which is not yet in the direction of travel can be detected and the lighting devices controlled accordingly.

If the directional sensors have lens-like elements, which may also have a smooth transition between them, the detection cone may be adjusted individually to the wishes of the automobile manufacturer.

Integration of the light guide body of the sensor unit into a light guide body of a rain sensor device makes it possible to eliminate additional components and to further reduce the number of components on the windshield which interfere with vision, in particular when the light guide body is manufactured in a multicomponent injection molding process together with the light guide body of the rain sensor and the coupling medium.

Brief Description Of The Drawings

Fig. 1 shows a section through a sensor unit according to the present invention.

Fig. 2 shows a diagram of the sensor unit integrated into a light guide body of a rain sensor in a perspective view.

Detailed Description

Fig. 1 shows a sensor unit 10 according to the present invention, mounted on a windshield 11, in particular a windshield of a motor vehicle. Sensor unit 10 is composed of multiple sensors 12, each sensor 12 including a sensor element 13 and a light guide element 14, 14a. However, two light guide elements 14 here together use one sensor element 13, so that there are three light-sensitive sensor elements 13 having four light guide elements 14 and 14a. The light guide body on

which light guide elements 14, 14a are mounted is composed of an at least partially transparent plate having cylindrical recesses sealed with lens-shaped round bodies. These cylindrical recesses together with the lens-shaped round bodies form a light guide element 14, 14a. If parallel light passes through the lens-shaped round bodies along the center axis of the cylindrical recesses, it yields a focal point f which characterizes a focal distance of light guide element 14, 14a.

Sensor elements 13 are each arranged between focal points f of light guide elements 14 and light guide elements 14 themselves. This yields a light detection cone directed forward in the direction of travel, allowing detection in predetermined directions. The cone angle of the light detection cone can be adjusted through the distance between focal points f of respective light guide element 14 and light-sensitive sensor elements 13.

An analyzer unit 15 controls the switching of a lighting device 16 as a function of the signals of sensor elements 13. Sensor elements 13 may be mounted jointly to a circuit board 17 and are preferably designed to permit a differentiation between daylight and artificial light to prevent a shutdown due to artificial lighting in a tunnel, for example. This can be accomplished through a suitable choice of the sensitivity range of sensor elements 13. It is also possible to select the sensitivity range so that certain spectral ranges or characteristic lines, e.g., of gas discharge lamps, are detected, thus permitting control of the high and low beams in a motor vehicle.

In addition to these directional sensors, at least one light guide element 14a is aimed forward but not necessarily in the direction of travel. The light detection cone of this minimum of one light guide element 14a has a very large cone angle and detects global lighting conditions outside the vehicle.

All light guide elements 14, 14a, in particular the sensors of the global sensors and directional sensors, are combined in one piece in a light guide body 18. This light

guide body 18 may be manufactured as an injection molded part of transparent or UV-permeable plastic. It is likewise possible to manufacture light guide body 18 of a pigmented or coated plastic which includes an optionally desired filter effect for influencing the sensitivity range of the sensor. This light guide body is pressed onto the windshield over a coupling medium 19, e.g., a silicone pad. Coupling medium 19 prevents air inclusions between windshield 11 and light guide body which would cause unwanted scattering. It is also possible to apply coupling medium 19 directly to light guide body 18 in the manufacture thereof in a multicomponent injection molding process.

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